

COST OF PRODUCTION SYSTEM BUDGETS

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COST OF PRODUCTION SYSTEM BUDGETS

The Resource and Environmental Policy (REP) Division of the Center for Agricultural and Rural Development (CARD) at Iowa State University needed accurate cost of production system (COPS) budgets to integrate into its existing environmental modeling system. These budgets would enhance the modeling capability by allowing simultaneous analysis of the environmental and economic impacts of environmental and agricultural policies. Consistent budgets were required for the 12-state study region encompassing the Corn Belt, Lake States, and Northern Plains (see Figure 1). To achieve the same level of detail as the environmental modeling system, these budgets also had to account for several crop rotations, various tillage systems, and the use of irrigation.

Cost and Returns Estimator (CARE) crop budgets serve as the primary source for these COPS budgets. These CARE budgets were created by Natural Resource Conservation Service (NRCS) staff in cooperation with Texas Agricultural Experiment Station personnel at the Blackland Research Center (USDA-NRCS 1996). Fertilizer application rates used in the CARE crop budgets were replaced with rotation-specific rates and the total costs recalculated, yielding the required rotation-specific cost of production budgets. What follows is a brief description of CARE and the development of its crop budgets, then an explanation of how the CARE input files were used to generate the CARD-REP rotation-specific COPS budgets. This paper includes several large tables with data that document these cost of production system budgets.

CARE Crop Budgets

CARE 2.2 is a DOS program designed to evaluate the costs and returns for growing various crops. It is intended for use by NRCS field office staff and other agencies working with farmers to provide financial and planning assistance, loan analysis, and program assistance

(USDA-NRCS 1994). Users can enter their own production and machinery data, or use the default data provided by NRCS crop budgets. These default crop budgets are the fundamental source for our rotation-specific cost of production budgets.

The NRCS developed the CARE crop budgets for each Agricultural Sector Model (ASM) region as part of the 1997 Resource Conservation Assessment (RCA). ASM regions generally coincide with states, except for Illinois, Indiana, Iowa, and Ohio, which are further subdivided along county lines (see Figure 1). The budgets were designed to be consistent across regions and across crops within regions to facilitate interregional analyses. The budgets are based on data from the United States Department of Agriculture (USDA) Cropping Practices Survey and the USDA Costs of Production,¹ as well as other National Agricultural Statistics Society (NASS) databases and the Census of Agriculture. The most frequent tillage and pesticide systems for each region were identified from these data. Tractor and equipment sizes were subjectively chosen for each ASM region using data on farm size from the Census of Agriculture. Fertilizer application rates were derived from the Cropping Practices Survey and nitrogen application rates were based on a function fit to crop yield and nitrogen application data (Benson, 1995). The final result is a unique budget for each crop, tillage system, and dryland-irrigation combination in every ASM region.

CARE Cost of Production Budgets

The input files for the CARE crop budgets were used to develop a cost of production budget for each state, region, crop, tillage, and irrigation combination in our study region. Each cost of production budget is separated into fixed and variable costs, and variable costs are further separated into machinery variable costs, machinery capital costs, input variable costs, and input capital costs. Fuel costs are included as part of machinery variable costs, but have been separated for energy use analysis. Labor costs are included as part of both machinery variable costs and input variable costs, but have been separated for labor demand analysis.

¹ These annual data sets are available at www.mannlib.cornell.edu/data-sets/inputs/93018/ and www.mannlib.cornell.edu/data-sets/farm/94010/.

Land rent, or mortgage costs, and management costs are not included in these budgets. Returns above these costs of production are returns to land and farmer management.

Table 1 presents the ASM regions in the study region and the abbreviations used to designate them. For locations of these ASM regions, see Figure 1. Table 2 presents the crop and rotation combinations required for the cost of production budgets and the abbreviations used to designate them. CARE budgets define three tillage systems: conventional tillage, conservation tillage, and no-till. Any tillage system that maintains less than 30 percent crop residue cover is defined as a conventional tillage system. Any system that maintains more than 30 percent crop residue cover is defined as a conservation tillage system. No till systems do not use any tillage implements other than no till planters or drills. Lastly, irrigation costs in CARE crop budgets assume center pivot irrigation systems using purchased water for all ASM regions.

For each ASM region, there is a group of unique CARE crop budgets consisting of a set of operations for a crop year. As an example, Table 3 presents the data used from the CARE input file containing the operations for irrigated corn in Nebraska under conventional tillage. For each specified date, data are given for the rate of machinery operation, the various pieces of machinery used, and any inputs used for that operation.

Machinery data in the operations file are linked to a unique machinery file for each ASM region. This machinery file provides region-specific per hour cost information for each piece of machinery used for an operation. Table 4 is a portion of the machinery file showing CARE machinery costs for all conventional tillage systems in Nebraska. These per hour machinery costs are converted to per acre machinery costs by Equation (1), using the indicated CARE rate of operation data as in Table 3.

$$\frac{\$}{ac} = \frac{\$}{hr} \left(\frac{8.25}{Speed * Width * Field Efficiency} \right) , \quad (1)$$

where speed is in miles per hour, operation width in feet, and field efficiency is the implement-specific efficiency factor. The 8.25 factor converts miles per hour to feet per hour and square feet to acres.

The input use data in the operations file are similarly linked to an input file that provides price information for all inputs used in that ASM region. Table 5 is a portion of the input file

showing the 1993 prices of inputs used by the Nebraska crop budgets for conventional tillage systems.

Aggregation of Costs of Production

Total cost is the sum of fixed and variable costs. No land rental or mortgage costs are included in CARE budgets, so the only fixed costs are costs associated with machinery ownership. Specifically, machinery fixed costs are the sum of storage costs, insurance, taxes, amortization, and interest costs due to ownership (see Table 4). CARE budgets do not include machinery insurance and tax costs, so these costs are missing from our budgets as well. Interest costs for financing machinery purchases use a long-term interest rate of 7 percent. Amortization and storage costs are included in the CARE cost analysis, using typical machinery types, sizes, ages, maintenance schedules, etc. for each region.

Variable costs are the sum of machinery variable costs and input variable costs, as well as machinery capital costs and input capital costs. Machinery variable costs are the sum of repair, fuel, lubrication, and labor costs associated with operating equipment (see Table 4). A wage rate of \$6 is used for all regions. Input variable costs are simply the sum of the product of input prices and quantities of each input used (see Table 5). For each operation, capital costs ($C_{CAPITAL}$) are calculated for both machinery and input variable costs using:

$$C_{CAPITAL} = C_{VARIABLE} [\exp(\frac{365-JDAY}{365} * 0.10) - 1] \quad , \quad (2)$$

where JDAY is the Julian day on which the variable cost ($C_{VARIABLE}$) is incurred. Beginning on the day each operation occurs, when the variable cost is incurred, continuous compounding at the short-term interest rate of 10 percent is used. Summing machinery capital costs and input capital costs across all operations yields the machinery capital costs and input capital costs for each budget.

Fuel costs are included as part of machinery variable costs, but have been extracted separately for energy use analysis. However, fuel consumption for crop drying, and the resulting costs, are not included in CARE budgets, and thus not in our budgets. Labor costs are included as part of both machinery variable costs and input variable costs, but also have been extracted separately for labor demand analysis. Again, the assumed wage rate is \$6.

Development of Rotation-Specific Fertilizer Application Rates

CARE crop budgets do not take into account management differences due to crop rotations. However, our modeling system required cost of production budgets for the rotations listed in Table 2. To create these rotation budgets, CARE crop-specific fertilizer rates were replaced with rotation-specific rates developed for use with CARD's environmental modeling systems. These rotation-specific fertilizer rates were developed using the following procedure.

Preliminary estimates of fertilizer application rates for crops in each state were obtained from the Firm Enterprise Data System (FEDS) budgets. These preliminary estimates were distributed among soil fertility experts from the appropriate states at the Soil Fertility Workshop held in St. Louis on October 27, 1994. These experts were asked to review the preliminary estimates and make suggested corrections. In addition, they were asked to estimate how irrigation and crop rotations affected these rates. From these survey results, fertilizer application rates were developed for each rotation in each state of the study region. These rates were then further revised according to published results of the 1994 Cropping Practices Survey (USDA-ERS 1995). The final rotation-specific fertilizer application rates for each state are presented in Table 6.

CARE budgets include nitrogen applications as either anhydrous ammonia or mineral nitrogen. Each form of fertilizer has a different cost and requires different implements to apply. The proportions of total nitrogen fertilizer applied as anhydrous ammonia and mineral nitrogen in the CARE budgets were maintained in the new rotation-specific fertilizer application rates. In other words, if the CARE budget for dryland corn in Northern Indiana under conservation tillage applied 80 percent of the total nitrogen as anhydrous ammonia, this same proportion was used in the CARD rotation-specific budgets for all nitrogen applications on dryland corn in Northern Indiana under conservation tillage in any rotation, despite the different amounts of fertilizer applied.

These rotation-specific fertilizer application rates were integrated into the cost of production budgets by adjusting input variable costs. First the cost of purchasing all fertilizers was subtracted from the input variable cost of each CARE crop budget. A cost of production

budget for each rotation was created by adding the cost of purchasing the fertilizer amounts specified for each rotation to the non-fertilizer costs of each crop. It was assumed that the application machinery operated at the same rate, but applied a different amount of fertilizer. Therefore, machinery variable costs were not changed for these different application rates. Furthermore, input capital costs were not changed to account for the new fertilizer costs since the changes would be slight. The final results are the rotation-specific cost of production budgets in Appendix.

Currently, pesticide use is not adjusted to account for the rotation of crops. CARE budgets include the cost information for several weed and insect control strategies; however, CARE budgets assume one strategy per crop budget. In the future, alternative pest control strategies will be identified for each rotation using the latest version of the Weather Impact Simulation on Herbicides (WISH II) developed by researchers in CARD-REP. The costs of these strategies will then be estimated using the information provided in the CARE input files.

Summary

To create rotation-specific cost of production budgets for the CARD-REP environmental modeling system, CARE crop budgets were reorganized and slightly modified. The final result, presented in Appendix A, is a unique cost of production budget for each rotation, tillage, and irrigation combination in every ASM region in the 12-state region encompassing the Corn Belt, Lake States, and Northern Plains. These consistent budgets allow comparisons across the study region and provide cost of production data for environmental and agricultural policy analysis.

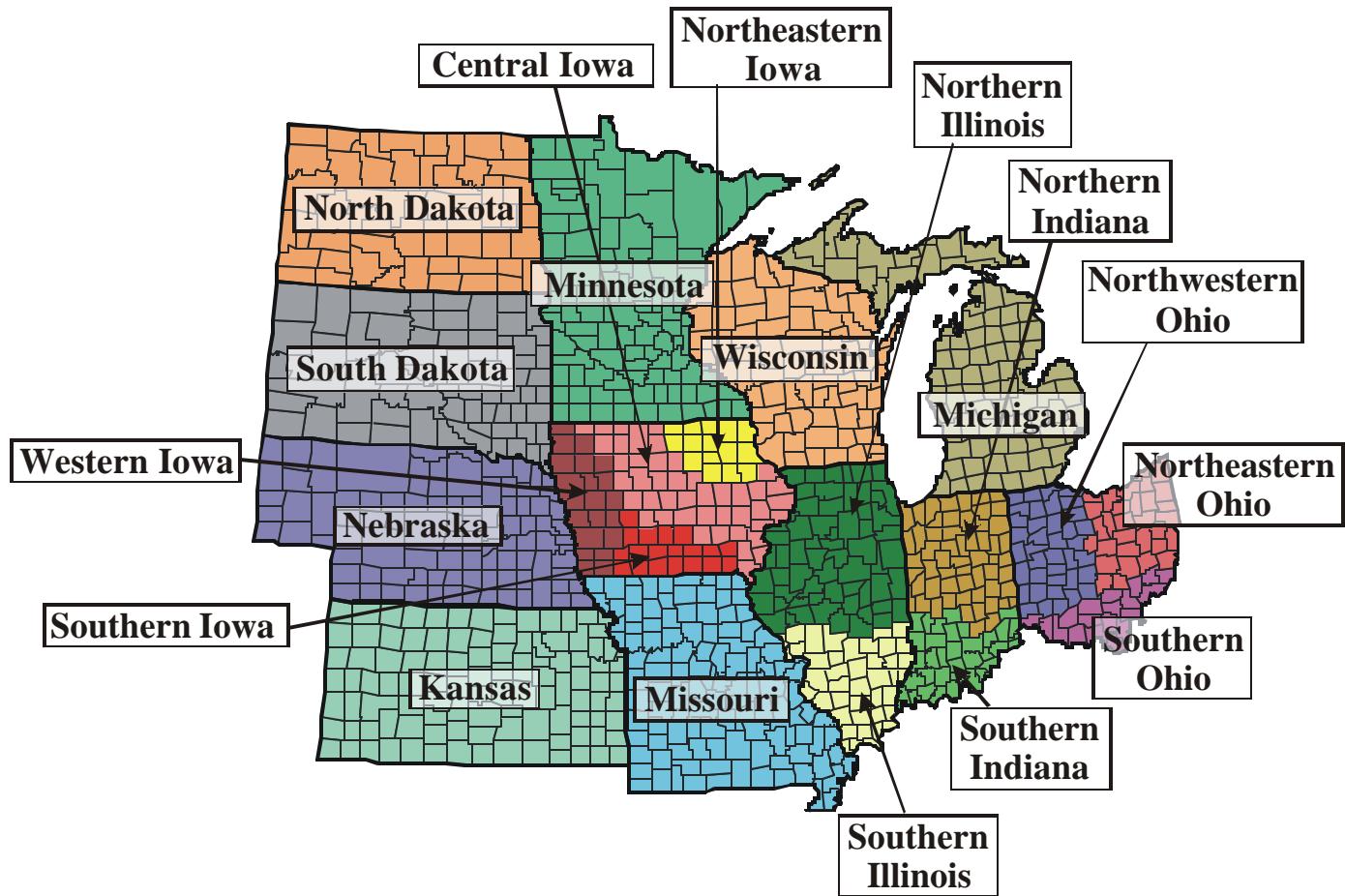


Figure 1: Agricultural Sector Model Regions for 12-State Study Area

Table 1. Agricultural Sector Model Regions and Abbreviations

Region Name	Abbreviation
Northern Illinois	NIL
Southern Illinois	SIL
Northern Indiana	NIN
Southern Indiana	SIN
Central Iowa	CIA
Northeastern Iowa	NEIA
Southern Iowa	SIA
Western Iowa	WIA
Kansas	KS
Michigan	MI
Minnesota	MN
Missouri	MO
North Dakota	ND
Northeastern Ohio	NEOH
Northwestern Ohio	NWOH
Southern Ohio	SOH
Nebraska	NE
South Dakota	SD
Wisconsin	WI

Table 2. Crop Rotation Names and Abbreviations

Rotation Name	Abbreviation
Corn following corn	cfc
Corn following soybeans	cfs
Corn following wheat	cfw
Corn following alfalfa	cfa
Corn following other	cfo
Soybeans following corn	sfc
Soybeans following soybeans	sfs
Soybeans following wheat	sfw
Soybeans following other	sfo
Wheat following corn	wfc
Wheat following soybeans	wfs
Wheat following wheat	wfw
Wheat following sorghum	wfg
Wheat following fallow	wff
Wheat following other	wfo
Sorghum following wheat	gfw
Sorghum following sorghum	gfg
Sorghum following fallow	gff
Sorghum following other	gfo
Alfalfa following corn	afc
Alfalfa following alfalfa	afa
Alfalfa following other	afo

Table 3. Operations for Irrigated Corn in Nebraska under Conventional Tillage

Table 4. Disaggregated Machinery Costs, in Dollars per Hour for Conventional Tillage Systems in Nebraska

Machinery Name	Total	Disaggregated Fixed Costs					Total	Disaggregated Variable Costs				Total
	Cost	Storage	Insurance	Taxes	Amortization	Interest	Fixed	Repairs	Fuel	Lubrication	Labor	Variable
Anhydrous Applicator, Trailer Mounted	35.34	1.98	0	0	20.42	0.65	23.05	11.89	0	0	0.4	\$12.29
Bale Wagon, PTO	1.93	0.03	0	0	1.12	0.02	1.17	0.36	0	0	0.4	0.76
Baler, Small, PTO	17.62	0.03	0	0	11.52	0.53	12.09	5.13	0	0	0.4	5.53
Chemical Applicator, Implement Attached	9.47	0.66	0	0	5.21	0.16	6.04	3.03	0	0	0.4	3.43
Chemical Applicator, Tractor Mounted, 30 ft	7.6	1.24	0	0	4.07	0.23	5.54	1.67	0	0	0.4	2.07
Chemical Applicator, Trailer Mounted, 30 ft	12.68	1.24	0	0	7.53	0.43	9.19	3.09	0	0	0.4	3.49
Chisel Plow, 15 ft	9.75	0.59	0	0	5.44	0.27	6.3	3.04	0	0	0.4	3.44
Culti-mulch Roller, 18 ft	13.92	0.59	0	0	10.16	0.5	11.25	2.27	0	0	0.4	2.67
Drill: Press, Disc, or Hoe	27.5	0.94	0	0	16.68	1.12	18.75	8.35	0	0	0.4	8.75
Dry Fertilizer Spreader, Trailer Mounted	6.43	1.98	0	0	2.51	0.08	4.57	1.46	0	0	0.4	1.86
Duckfoot Cultivator	5.72	0.36	0	0	3.31	0.16	3.84	1.48	0	0	0.4	1.88
Fertilizer Applicator, Implement Attached	6.81	0.66	0	0	3.56	0.11	4.34	2.07	0	0	0.4	2.47
Field Cultivator, 15 ft	10.25	0.59	0	0	6.18	0.31	7.08	2.76	0	0	0.4	3.16
Offset Disk, Heavy Duty, 14-18 ft	25.18	0.53	0	0	17.51	0.87	18.91	5.87	0	0	0.4	6.27
Offset Disk, Light Duty, 14-18 ft	16.14	0.53	0	0	10.99	0.54	12.06	3.68	0	0	0.4	4.08
Planter, 6 Row	25.27	0.41	0	0	14.96	1.26	16.63	8.24	0	0	0.4	8.64
Rotary Hoe	9.84	1.15	0	0	7.17	0.01	8.33	1.11	0	0	0.4	1.51
Row Cultivator, 15 ft	8.83	0.5	0	0	4.94	0.24	5.67	2.76	0	0	0.4	3.16
Silage Harvester	26.62	0.17	0	0	18.59	0.49	19.24	6.98	0	0	0.4	7.38
Subsoil Chisel Plow	12.76	0.59	0	0	7.31	0.36	8.27	4.09	0	0	0.4	4.49
Tandem Disk, 14-18 ft	15.22	0.53	0	0	10.32	0.51	11.36	3.46	0	0	0.4	3.86
Tractor: 2WD, 160 HP, Diesel	28.69	0	0	0	8.62	1.33	9.95	6.91	5.75	0.58	5.5	18.74

Table 5. Input Prices and Units for Nebraska Conventional Tillage systems

Input Name	Units	Price
2,4-D	Pints	\$1.37
Anhydrous	Pounds	0.094
Atrazine	Pounds	14.11
Baler Twine	Bales	0.03
Custom Combine	Acres	12.50
Custom Fertilizer Application	Acres	53.04
Custom Hauling	Bushels	0.30
Custom Hauling	Tons	2.50
Custom Herbicide Application	Acres	3.00
Custom Insecticide Application	Acres	3.00
Custom Labor	Hours	6.00
Custom Pesticide Application	Acres	15.83
Dithane	Pounds	2.82
Dual	Gallons	54.00
Furadan	Pounds	1.58
Gramoxone Extra	Pints	3.82
Guthion	Pounds	4.92
Irrigation Labor	Hours	6.00
Lasso	Gallons	25.40
Mocap	Pounds	1.16
Monitor	Gallons	69.69
Nitrogen	Pounds	0.09
Phosphorous	Pounds	0.10
Potassium	Pounds	0.08
Seed Corn	Bag	69.86
Seed Sorghum	Pounds	0.68
Seed Soybeans	Pounds	0.23
Seed Wheat	Bushels	7.25
Sencor	Pounds	20.50
Straw Mulch	Tons	30.00
Sulphur	Pounds	0.61
Telone	Gallons	55.00
Thiodan	Gallons	28.57
Tissue Testing	Acres	1.00
Treflan	Pints	4.01
Water	Acre Inch	2.35

Table 6. Rotation-Specific Fertilizer Application Rates, (pounds per acre), by State

State	Rotation	Dryland		Irrigated	
		N	P	N	P
Illinois	cfc	150	75	190	90
Illinois	cfs	110	75	135	90
Illinois	cfw	120	75	150	90
Illinois	cfa	130	75	160	90
Illinois	cfo	120	75	150	90
Illinois	sfc	0	50	0	60
Illinois	sfs	30	50	40	60
Illinois	sfw	0	50	0	60
Illinois	sfo	0	50	0	60
Illinois	wfc	30	40	40	50
Illinois	wfs	30	40	40	50
Illinois	afc	30	40	40	50
Illinois	afa	30	40	40	50
Illinois	afo	30	40	40	50
Indiana	cfc	150	75	190	90
Indiana	cfs	110	75	135	90
Indiana	cfw	120	75	150	90
Indiana	cfa	130	75	160	90
Indiana	cfo	120	75	150	90
Indiana	sfc	0	50	0	60
Indiana	sfs	20	50	40	60
Indiana	sfw	0	50	0	60
Indiana	sfo	0	50	0	60
Indiana	wfc	30	40	40	50
Indiana	wfs	30	40	40	50
Indiana	afc	30	40	40	50
Indiana	afa	30	40	40	50
Indiana	afo	30	40	40	50
Iowa	cfc	125	60	160	75
Iowa	cfs	105	60	130	75
Iowa	cfw	120	60	150	75
Iowa	cfa	130	60	165	75
Iowa	cfo	120	60	150	75
Iowa	sfc	0	50	0	60
Iowa	sfs	25	50	30	60
Iowa	sfw	0	50	0	60
Iowa	sfo	0	50	0	60
Iowa	wfc	30	40	40	50
Iowa	wfs	30	40	40	50
Iowa	afc	30	50	40	60
Iowa	afa	30	50	40	60
Iowa	afo	30	50	40	60

Table 6. (Continued) Rotation-Specific Fertilizer Application Rates, (pounds per acre), by State

State	Rotation	Dryland		Irrigated	
		N	P	N	P
Kansas	cfc	120	20	175	30
Kansas	cfs	100	20	155	30
Kansas	cfw	120	20	175	30
Kansas	cfa	100	20	155	30
Kansas	cfo	120	20	175	30
Kansas	sfc	5	20	10	30
Kansas	sfs	5	20	10	30
Kansas	sfw	5	20	10	30
Kansas	sfo	5	20	10	30
Kansas	wfc	55	20	80	30
Kansas	wfs	55	20	80	30
Kansas	wfg	55	20	80	30
Kansas	wff	55	20	80	30
Kansas	wfo	55	20	80	30
Kansas	gfw	100	10	140	25
Kansas	gfg	100	10	140	25
Kansas	gff	100	10	140	25
Kansas	gfo	100	10	140	25
Kansas	afc	0	70	0	70
Kansas	afa	0	70	0	70
Kansas	afo	0	70	0	70
Michigan	cfc	120	50	150	60
Michigan	cfs	95	50	120	60
Michigan	cfw	120	50	150	60
Michigan	cfa	105	50	130	60
Michigan	cfo	120	50	150	60
Michigan	sfc	10	30	15	40
Michigan	sfs	10	30	15	40
Michigan	sfw	10	30	15	40
Michigan	sfo	10	30	15	40
Michigan	wfc	70	35	90	45
Michigan	wfs	70	35	90	45
Michigan	wfw	70	35	90	45
Michigan	afc	20	40	25	50
Michigan	afa	35	40	45	50
Michigan	afo	20	40	25	50

Table 6. (Continued) Rotation-Specific Fertilizer Application Rates, (pounds per acre), by State

State	Rotation	Dryland		Irrigated	
		N	P	N	P
Minnesota	cfc	110	50	145	60
Minnesota	cfs	100	50	135	60
Minnesota	cfw	110	50	145	60
Minnesota	cfa	100	50	135	60
Minnesota	cfo	110	50	145	60
Minnesota	sfc	0	80	0	100
Minnesota	sfs	20	80	25	100
Minnesota	sfw	0	80	0	100
Minnesota	sfo	0	80	0	100
Minnesota	wfc	60	80	75	100
Minnesota	wfs	60	80	75	100
Minnesota	wfw	60	80	75	100
Minnesota	afc	20	40	25	50
Minnesota	afa	35	40	45	50
Minnesota	afo	20	40	25	50
Missouri	cfc	140	55	175	70
Missouri	cfs	120	55	150	70
Missouri	cfw	140	55	175	70
Missouri	cfa	120	75	150	90
Missouri	cfo	140	55	175	70
Missouri	sfc	0	40	0	50
Missouri	sfs	30	40	40	50
Missouri	sfw	0	40	0	50
Missouri	sfo	0	40	0	50
Missouri	wfc	70	65	90	80
Missouri	wfs	70	65	90	80
Missouri	afc	30	50	40	60
Missouri	afa	60	50	75	60
Missouri	afo	30	50	40	60

Table 6. (Continued) Rotation-Specific Fertilizer Application Rates, (pounds per acre), by State

State	Rotation	Dryland		Irrigated	
		N	P	N	P
Nebraska	cfc	110	30	160	40
Nebraska	cfs	100	30	155	40
Nebraska	cfw	110	30	160	40
Nebraska	cfa	100	30	155	40
Nebraska	cfo	110	30	160	40
Nebraska	sfc	0	30	0	50
Nebraska	sfs	20	30	20	50
Nebraska	sfw	0	30	0	50
Nebraska	sfo	0	30	0	50
Nebraska	wfc	30	40	40	25
Nebraska	wfs	30	40	40	25
Nebraska	wfg	30	40	40	25
Nebraska	wff	30	40	40	25
Nebraska	wfo	30	40	40	25
Nebraska	gfw	80	45	120	25
Nebraska	gfg	80	45	120	25
Nebraska	gff	80	45	120	25
Nebraska	gfo	80	45	120	25
Nebraska	afc	0	30	0	30
Nebraska	afa	0	30	0	30
Nebraska	afo	0	30	0	30
North Dakota	cfc	120	60	180	60
North Dakota	cfs	60	60	90	60
North Dakota	cfw	120	60	180	60
North Dakota	cfa	60	60	90	60
North Dakota	cfo	120	60	180	60
North Dakota	sfc	20	40	25	40
North Dakota	sfs	20	40	25	40
North Dakota	sfw	20	40	25	40
North Dakota	sfo	20	40	25	40
North Dakota	wfc	60	60	75	60
North Dakota	wfs	60	60	75	60
North Dakota	wfg	60	60	75	60
North Dakota	wff	60	60	75	60
North Dakota	wfo	60	60	75	60
North Dakota	gfw	80	40	100	60
North Dakota	gfg	80	40	100	60
North Dakota	gff	80	40	100	60
North Dakota	gfo	80	40	100	60
North Dakota	afc	0	0	0	0
North Dakota	afa	0	0	0	0
North Dakota	afo	0	0	0	0

Table 6. (Continued) Rotation-Specific Fertilizer Application Rates, (pounds per acre), by State

State	Rotation	Dryland		Irrigated	
		N	P	N	P
Ohio	cfc	150	70	190	90
Ohio	cfs	105	70	130	90
Ohio	cfw	120	70	150	90
Ohio	cfa	130	70	165	90
Ohio	cfo	120	70	150	90
Ohio	sfc	0	50	0	60
Ohio	sfs	15	50	20	60
Ohio	sfw	0	50	0	60
Ohio	sfo	0	50	0	60
Ohio	wfc	30	40	40	50
Ohio	wfs	30	40	40	50
Ohio	afc	0	70	0	85
Ohio	afa	5	70	10	85
Ohio	afo	0	70	0	85
South Dakota	cfc	90	60	180	60
South Dakota	cfs	60	60	90	60
South Dakota	cfw	80	60	180	60
South Dakota	cfa	60	60	90	60
South Dakota	cfo	80	60	180	60
South Dakota	sfc	20	40	25	40
South Dakota	sfs	20	40	25	40
South Dakota	sfw	20	40	25	40
South Dakota	sfo	20	40	25	40
South Dakota	wfc	60	60	75	60
South Dakota	wfs	60	60	75	60
South Dakota	wfg	60	60	75	60
South Dakota	wff	60	60	75	60
South Dakota	wfo	60	60	75	60
South Dakota	gfw	80	40	100	40
South Dakota	gfg	80	40	100	40
South Dakota	gff	80	40	100	40
South Dakota	gfo	80	40	100	40
South Dakota	afc	0	0	0	0
South Dakota	afa	0	0	0	0
South Dakota	afo	0	0	0	0

Table 6. (Continued) Rotation-Specific Fertilizer Application Rates, (pounds per acre), by State

State	Rotation	Dryland		Irrigated	
		N	P	N	P
Wisconsin	cfc	90	70	125	90
Wisconsin	cfs	80	70	110	90
Wisconsin	cfw	90	70	125	90
Wisconsin	cfa	80	70	110	90
Wisconsin	cfo	90	70	125	90
Wisconsin	sfc	10	65	15	80
Wisconsin	sfs	10	65	15	80
Wisconsin	sfw	10	65	15	80
Wisconsin	sfo	10	65	15	80
Wisconsin	wfc	60	40	75	50
Wisconsin	wfs	60	40	75	50
Wisconsin	wfw	60	40	75	50
Wisconsin	afc	20	40	25	50
Wisconsin	afa	35	40	45	50
Wisconsin	afo	20	40	25	50

APPENDIX A

ASM				Total	Total	Total	Machinery Costs				Input Costs		
Region	Rotation	Tillage	Irrigation	Cost	Variable	Fixed	Fixed	Variab	Labor	Fuel	Capital	Variable	Capital
WI	sfo	No Till	Dryland	112.90	92.83	20.07	20.07	27.98	5.57	5.75	0.81	60.78	3.26
WI	sfo	No Till	Irrigated	259.95	173.36	86.59	86.59	46.29	6.02	6.61	1.57	119.57	5.93
WI	wfs	Conventional	Dryland	96.82	64.51	32.32	32.32	27.46	6.67	6.54	1.16	33.89	1.99
WI	wfs	Conservation	Dryland	105.30	76.24	29.06	29.06	25.25	6.15	6.19	1.02	47.09	2.87
WI	wfs	No Till	Dryland	87.79	59.69	28.10	28.10	22.85	4.93	5.37	0.95	33.89	1.99
WI	wfc	Conventional	Dryland	96.82	64.51	32.32	32.32	27.46	6.67	6.54	1.16	33.89	1.99
WI	wfc	Conservation	Dryland	105.30	76.24	29.06	29.06	25.25	6.15	6.19	1.02	47.09	2.87
WI	wfc	No Till	Dryland	87.79	59.69	28.10	28.10	22.85	4.93	5.37	0.95	33.89	1.99
WI	wfw	Conventional	Dryland	96.82	64.51	32.32	32.32	27.46	6.67	6.54	1.16	33.89	1.99
WI	wfw	Conservation	Dryland	105.30	76.24	29.06	29.06	25.25	6.15	6.19	1.02	47.09	2.87
WI	wfw	No Till	Dryland	87.79	59.69	28.10	28.10	22.85	4.93	5.37	0.95	33.89	1.99

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